Grid Automation Controller COM600 4.0
External OPC Client Access User's Manual

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1. About this manual

1.1. Copyrights

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1.2. Trademarks

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1.3. General

This user’s manual provides thorough information on Station Automation COM600 (later referred to as COM600), focusing on giving instructions of how a 3rd party OPC Client can access the OPC servers of COM600.

Information in this user’s manual is intended for application engineers who have to access the OPC servers of COM600 with a 3rd party OPC Client and have to configure the different components. As a prerequisite, you must have basic knowledge of client and server architectures in general.

1.4. Document conventions

The following conventions are used for the presentation of material:

- The words in names of screen elements (for example, the title in the title bar of a window, the label for a field of a dialog box) are initially capitalized.
- Capital letters are used for the name of a keyboard key if it is labeled on the keyboard. For example, press the ENTER key.
- Lowercase letters are used for the name of a keyboard key that is not labeled on the keyboard. For example, the space bar, comma key, and so on.
- Press CTRL+C indicates that you must hold down the CTRL key while pressing the C key (to copy a selected object in this case).
- Press ESC E C indicates that you press and release each key in sequence (to copy a selected object in this case).
- The names of push and toggle buttons are boldfaced. For example, click **OK**.
- The names of menus and menu items are boldfaced. For example, the **File** menu.
  - The following convention is used for menu operations: **MenuName** > **MenuItem** > **CascadedMenuItem**. For example: select **File** > **New** > **Type**.
  - The **Start** menu name always refers to the **Start** menu on the Windows taskbar.
- System prompts/messages and user responses/input are shown in the Courier font. For example, if you enter a value out of range, the following message is displayed:

```
Entered value is not valid. The value must be 0 - 30  .
```

- You can be asked to enter the string MIF349 in a field. The string is shown as follows in the procedure:

  MIF349
- Variables are shown using lowercase letters:

  sequence name

1.5. Use of symbols

This publication includes warning, caution, and information icons that point out safety-related conditions or other important information. It also includes tip icons to point out useful information to the reader. The corresponding icons should be interpreted as follows.

The electrical warning icon indicates the presence of a hazard which could result in electrical shock.

The warning icon indicates the presence of a hazard which could result in personal injury.

The caution icon indicates important information or warning related to the concept discussed in the text. It may indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.

The information icon alerts the reader to relevant facts and conditions.

The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

1.6. Terminology

Term	Description
Alarm	An abnormal state of a condition.
Alarms and Events; AE	An OPC service for providing information about alarms and events to OPC clients.
Data Access; DA	An OPC service for providing information about process data to OPC clients.
Data Object; DO	Part of a logical node object representing specific information, for example, status, or measurement. From an object-oriented point of view, a data object is an instance of a class data object. DOs are normally used as transaction objects; that is, they are data structures.
Data Set	The data set is the content basis for reporting and logging. The data set contains references to the data and data attribute values.
Device	A physical device that behaves as its own communication node in the network, for example, protection relay.
Event	Change of process data or an OPC internal value. Normally, an event consists of value, quality, and timestamp.
Intelligent Electronic Device	A physical IEC 61850 device that behaves as its own communication node in the IEC 61850 protocol.
Logical Device; LD	Representation of a group of functions. Each function is defined as a logical node. A physical device consists of one or several LDs.
Logical Node; LN	The smallest part of a function that exchanges data. An LN is an object defined by its data and methods.
LON	A communication protocol developed by Echelon.

Term	Description
LON Application Guideline for substation automation; LAG	A proprietary method of ABB on top of the standard LON protocol.
OPC	Series of standards specifications aiming at open connectivity in industrial automation and the enterprise systems that support industry.
OPC item	Representation of a connection to the data source within the OPC server. An OPC item is identified by a string <object path>:<property name>. Associated with each OPC item are Value, Quality, and Time Stamp.
Property	Named data item.
Report Control Block	The report control block controls the reporting processes for event data as they occur. The reporting process continues as long as the communication is available.
SPA	ABB proprietary communication protocol used in substation automation.
SPA device	Protection and/or Control Product supporting the SPA protocol version 2.5 or earlier.
Substation Configuration Language; SCL	XML-based description language for configurations of electrical substation IEDs. Defined in IEC 61850 standard.

1.7. Abbreviations

Abbreviation	Description
AE	Alarms and Events
ASDU	Application Service Data Unit
BRCB	Buffered Report Control Block
DA	Data Access
DMCD	Data Message Code Definition
DO	Data Object
GW	Gateway, component connecting two communication networks together
HMI	Human Machine Interface
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Device
LAG	LON Application Guideline for substation automation
LAN	Local Area Network
LD	Logical Device

Abbreviation	Description
LMK	LonMark interoperable device communicating in LonWorks network. In this document, the term is used for devices that do not support the ABB LON/LAG communication.
LN	Logical Node
LSG	LON SPA Gateway
NCC	Network Control Center
NUC	Norwegian User Convention
NV	Network Variable
OLE	Object Linking and Embedding
OPC	OLE for Process Control
P&C	Protection & Control
PLC	Programmable Logic Controller
POU	Program Organization Unit
RTS	Request To Send
SA	Substation Automation
SCD	Substation Configuration Description
SCL	Substation Configuration Language
SFC	Sequential Function Chart
SLD	Single Line Diagram
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
SOAP	Simple Object Access Protocol
RCB	Report Control Block
URCB	Unbuffered Report Control Block
XML	eXtended Markup Language

1.8. Related documents

Name of the manual	MRS number
COM600 User’s Manual	1MRS756125

1.9. Document revisions

Document version/date	Product revision	History
A/10.3.2005	1.0	Document created
B/16.10.2006	3.0	Document revised
C/21.12.2007	3.1	Document revised
D/17.6.2008	3.2	Document revised
E/13.2.2009	3.3	Document revised
F/06.11.2009	3.4	Document revised
G/30.6.2011	3.5	Document revised
H/31.5.2012	4.0	Document revised

2. Introduction

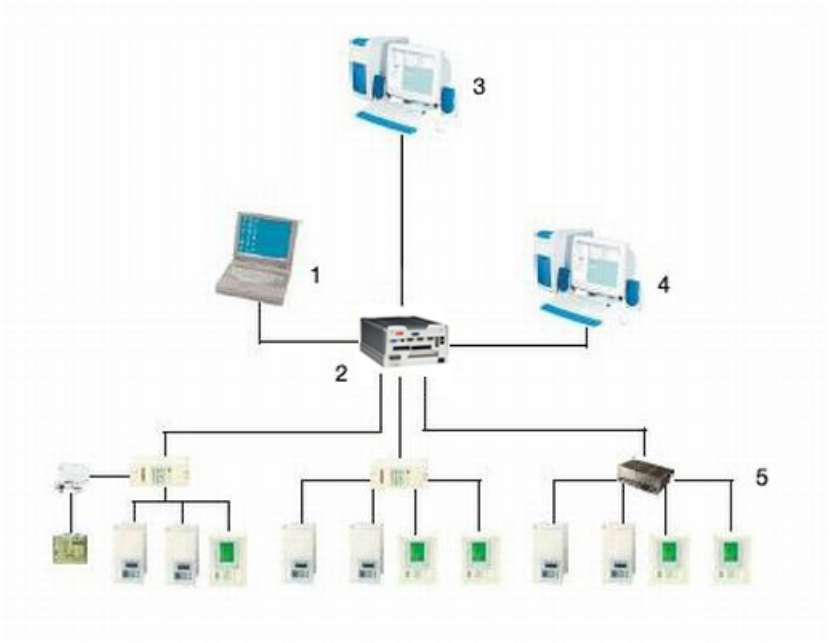
2.1. About this section

In this section, you will find an overview of a typical system with COM600 and a 3rd party OPC Client accessing the OPC servers of this gateway.

This section also gives an overview of the internal structure of COM600 as well as of COM600 OPC servers.

2.2. COM600 with 3rd party OPC Client

Below you can see an overview of a typical COM600 system with a third party OPC Client.



overview.jpg

Figure 2.2-1 System overview

1. Station Automation Builder 600 (SAB600)
2. COM600
3. NCC
4. 3rd party system with an OPC Client
5. Protection and control devices

COM600 uses OPC servers for master/client protocol stacks to provide access to the data in the devices connected to COM600. COM600 slave OPC clients use these OPC

servers internally to provide data for remote systems with a certain communication protocol.

Each slave OPC Client component includes a small OPC Data Access server for diagnostic and control purposes. External OPC Clients can also access the OPC servers of COM600 if enabled in the COM600 license. Third party control systems with OPC Client can therefore easily access data from COM600 without using any conventional communication protocol.

External OPC Clients are connected to COM600 via LAN using DCOM. DCOM must be configured both in the client computer and in COM600 to allow the access. More about DCOM configuration is explained in 3.6, DCOM configuration.

2.3. Common features of OPC servers of COM600

- Supports OPC Data Access 1.0/2.0 specification for process and diagnostic data
- OPC namespace and process data modeled according the IEC61850 standard
- Update rate zero supported on OPC DA for no-loss-of-events based update
- OPC DA items timestamped by the source device when applicable by the protocol and device
- OPC items for system supervision and communication diagnostic and control
- Supports OPC Alarm&Event 1.10 specification for process and diagnostic data

3. Accessing OPC servers of COM600

3.1. About this section

In this section, there is a list of the requirements that have to met by the 3rd party OPC Client as well as information on Windows settings (user IDs, DCOM).

This section also gives you an overview of how to access the OPC servers of COM600 with a 3rd party OPC Client.

3.2. Requirements for the OPC Client

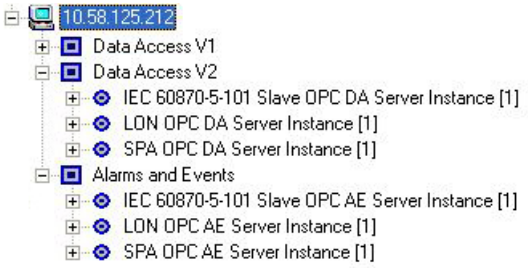
- Windows 2000 or XP operating system
- Support for OPC Data Access 2.0 Specification
- LAN/DCOM connection to COM600
- Possibility to modify DCOM and possible firewall settings to allow OPC DCOM communication with COM600

3.3. COM600 OPC servers

In Figure 3.3-1 and Figure 3.3-2 you can see the difference between viewing the OPC servers and clients of an example project in Station Automation Builder 600 (later referred to as SAB600), and viewing them in a 3rd party browser.

SAB600_servers.bmp

Figure 3.3-1 Example project as seen in SAB600


10.58.125.212
Data Access V1
Data Access V2
IEC 60870-5-101 Slave OPC DA Server Instance [1]
LON OPC DA Server Instance [1]
SPA OPC DA Server Instance [1]
Alarms and Events
IEC 60870-5-101 Slave OPC AE Server Instance [1]
LON OPC AE Server Instance [1]
SPA OPC AE Server Instance [1]

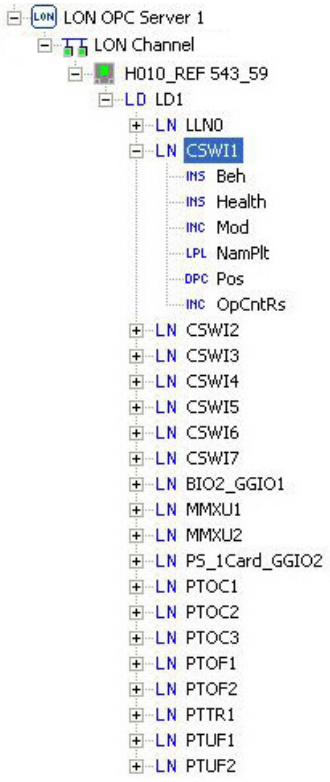
OPC_Servers.jpg

Figure 3.3-2 Example project loaded to COM600 and browsed with a 3rd party OPC Client

The 3rd party browser shows the separate servers for the Data Access and Alarms and Events. The instance numbers of the servers are embedded in brackets to the name of the server. The diagnostic and control OPC servers for the IEC101 Slave are also shown in the list.

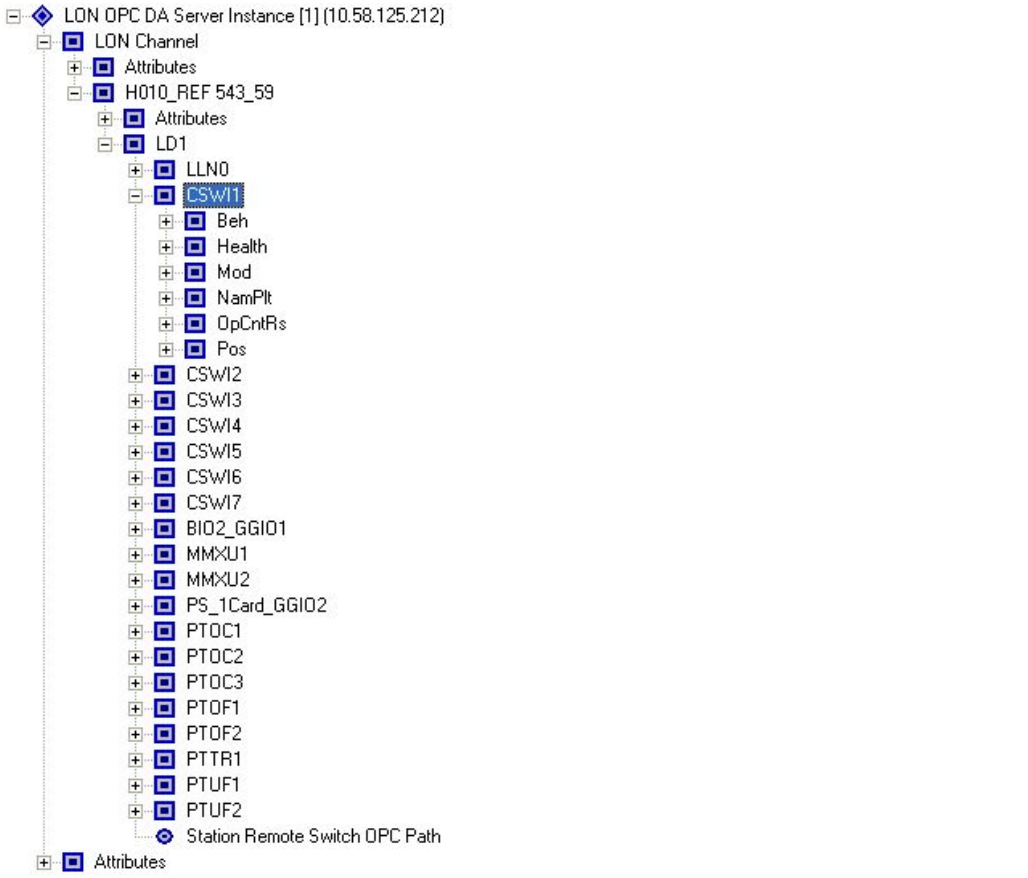
3.4. Data access

The OPC server namespace consists of channels, IEDs, logical devices, logical nodes, and data objects.



LON_OPC_Server_namespace_in_SAB600.jpg

Figure 3.4-1 LON OPC Server namespace in SAB600

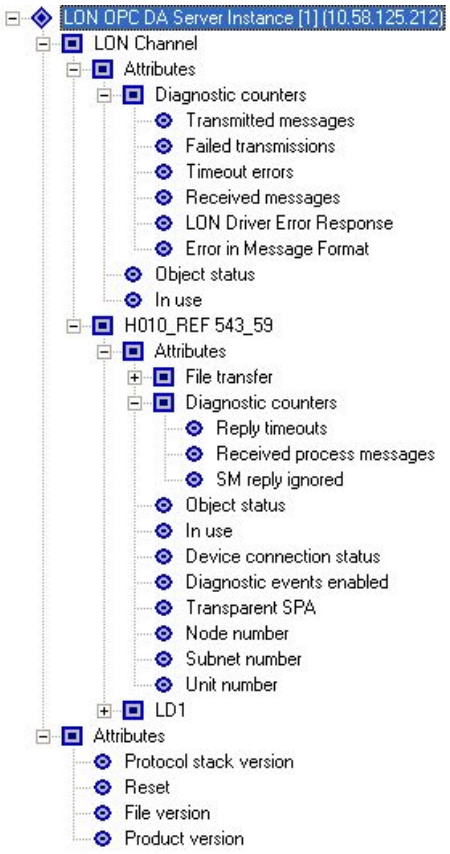


LON_OPC_Server_namespace.jpg

Figure 3.4-2 LON OPC Server namespace in 3rd party OPC Client

LON OPC Server namespace in SAB600 and 3rd party OPC Client are almost identical with some differences. For example, the scale definitions seen in the SAB600 namespace are not visible in the OPC server namespace, and the attributes appear in the OPC server namespace but not in the SAB600 namespace.

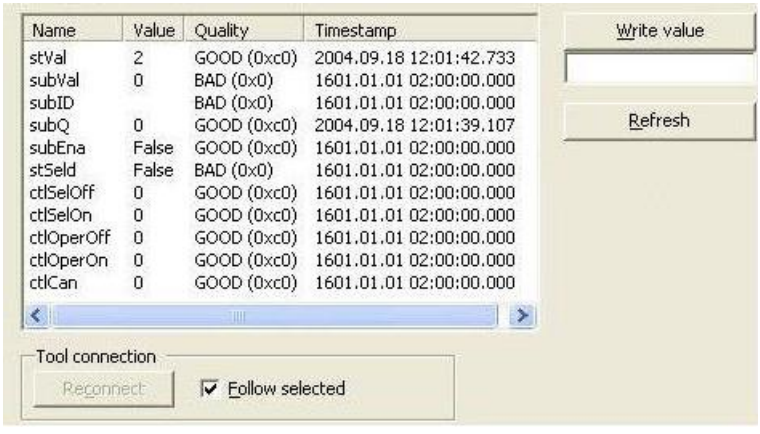
Attributes (Figure 3.4-3) contain OPC items for communication diagnostics and special functions like file transfer and transparent communication access.



attributes.jpg

Figure 3.4-3 LON OPC Server namespace and the attributes

The OPC items in data objects contain the actual process data. The items are not visible in the SAB600 namespace but they can be monitored online using the Diagnostic Tool in Figure 3.4-4.


Name Value Quality Timestamp
stVal 2 GOOD (0xc0) 2004.09.18 12:01:42.733
subVal 0 BAD (0x0) 1601.01.01 02:00:00.000
subID BAD (0x0) 1601.01.01 02:00:00.000
subQ 0 GOOD (0xc0) 2004.09.18 12:01:39.107
subEna False GOOD (0xc0) 1601.01.01 02:00:00.000
stSeld False BAD (0x0) 1601.01.01 02:00:00.000
ctlSelOff 0 GOOD (0xc0) 1601.01.01 02:00:00.000
ctlSelOn 0 GOOD (0xc0) 1601.01.01 02:00:00.000
ctlOperOff 0 GOOD (0xc0) 1601.01.01 02:00:00.000
ctlOperOn 0 GOOD (0xc0) 1601.01.01 02:00:00.000
ctlCan 0 GOOD (0xc0) 1601.01.01 02:00:00.000
Write value
Refresh
Tool connection
Reconnect
Follow selected

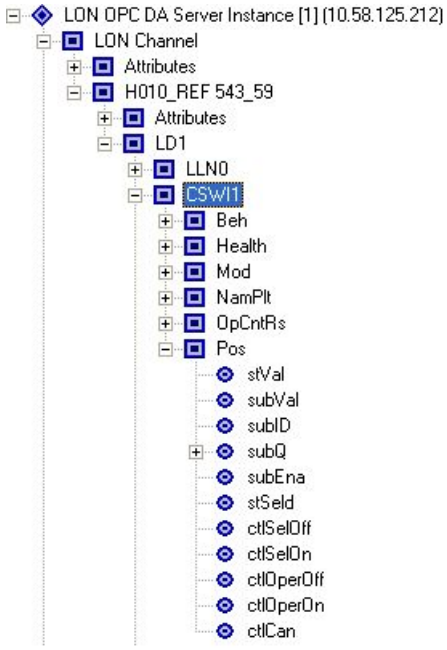
pos_dpc_online_diagnostics.jpg

Figure 3.4-4 OPC items of Pos data object monitored with SAB600 online diagnostics. Pos object is an instance of DPC (Controllable Double Point) data class.

For the 3rd party OPC Client, the OPC items can be found from the namespace below the data objects in Figure 3.4-5. OPC items of a data object are specified by the data class of the object.

Generally, the names and the usage of these OPC items are protocol independent. Further information about the data classes, their OPC items and mapping to certain protocol can be found from the data object modeling chapter in the technical reference of protocol-specific user's manuals.

For more information on data modeling according to the IEC 61850 standard, refer to the section IEC 61850 Data modeling in COM600 User's Manual.



pos_dpc.jpg

Figure 3.4-5 OPC server namespace with the OPC items of Pos data object viewed with 3rd party OPC Client

Figure 3.4-6 shows group of OPC items subscribed by 3rd party OPC Client and monitored in a Diagnostic Tool. The figure also shows how the full OPC item name consists of the complete path name to the object with the backslash '\' character as a separator.

Item	Value	Quality	TimeStamp	Server	Group
LON Channel\H010_REF 543_59\LD1\CSWI1\Pos\stVal	2	GOOD	09:01:42.733	LON OPC ...	Group
LON Channel\H010_REF 543_59\LD1\CSWI1\Pos\ctlSelOff	0	GOOD	00:00:00.000	LON OPC ...	Group
LON Channel\H010_REF 543_59\LD1\CSWI1\Pos\ctlSelOn	0	GOOD	00:00:00.000	LON OPC ...	Group
LON Channel\H010_REF 543_59\LD1\CSWI1\Pos\ctlOperOff	0	GOOD	00:00:00.000	LON OPC ...	Group
LON Channel\H010_REF 543_59\LD1\CSWI1\Pos\ctlOperOn	0	GOOD	00:00:00.000	LON OPC ...	Group
LON Channel\H010_REF 543_59\LD1\CSWI1\Pos\ctlCan	0	GOOD	00:00:00.000	LON OPC ...	Group
LON Channel\H010_REF 543_59\Attributes\Device connection status	-1	GOOD	09:01:42.432	LON OPC ...	Group

opc_items_monitored_with_3rd_party_opc_client.jpg

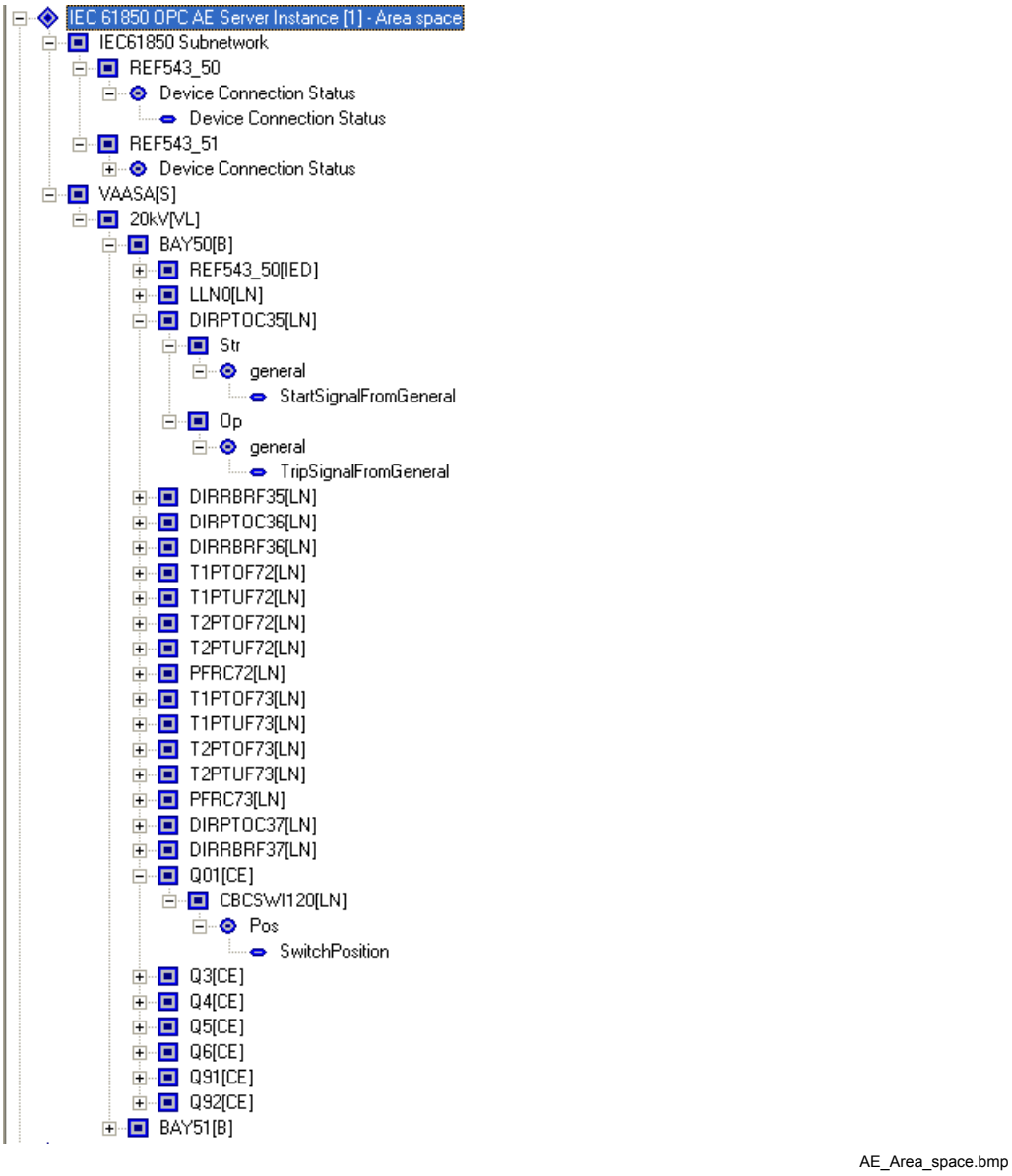
Figure 3.4-6 OPC items monitored with 3rd party OPC Client

3.5. Alarms and Events

The OPC Alarms and Events server interface is available for each master and slave protocol component. For both master and slave components, it can be used for supervising the communication status with diagnostics events. For master protocols, it is also possible to configure alarms and events for process data. Alarms and events are configured by linking the data objects and event definitions. See COM600 User's Manual for detailed information about the configuration of alarms and events.

The names for alarms and events are based either on the communication structure or substation structure names. If the data is connected to the substation structure, the name is based on the substation structure, otherwise the name is based on the communication structure.

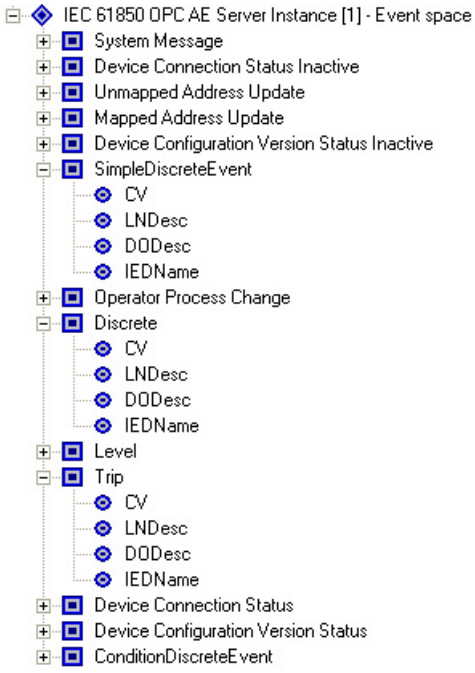
Simple and condition type events can be configured for discrete signals, for example single and double point status as well as for measurement limit value supervision. Control operations can be configured for tracking events. The event area of the OPC servers can be browsed using the browsing interface, see Figure 3.5-1.



AE_Area_space.bmp

Figure 3.5-1 An example view of the area space of an OPC server

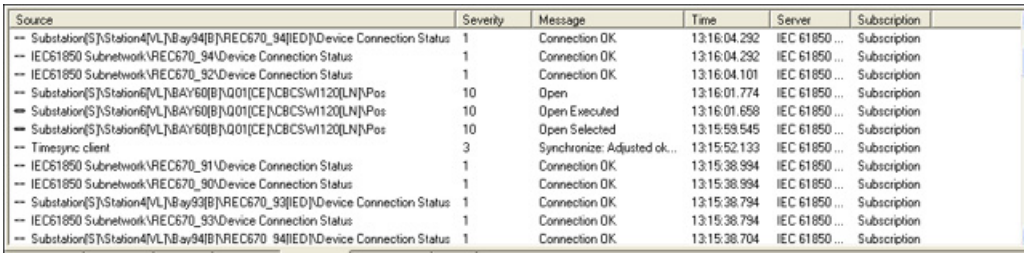
Event categories and their vendor-specific attributes are shown in Figure 3.5-2.



AE_Event_space.jpg

Figure 3.5-2 An example view of event categories of an OPC server

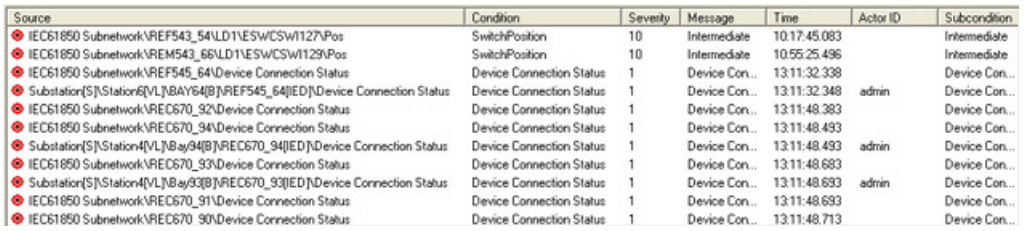
Example views of simple and tracking events and condition events are shown in Figure 3.5-3 and Figure 3.5-4.



Source	Severity	Message	Time	Server	Subscription
Substation[S]\Station4[VL]\Bay94[B]\REC670_94[IED]\Device Connection Status	1	Connection OK	13:16:04.292	IEC 61850 ...	Subscription
IEC61850 Subnetwork\REC670_94\Device Connection Status	1	Connection OK	13:16:04.292	IEC 61850 ...	Subscription
IEC61850 Subnetwork\REC670_92\Device Connection Status	1	Connection OK	13:16:04.101	IEC 61850 ...	Subscription
Substation[S]\Station6[VL]\BAY60[B]\Q01[CE]\CBCSWI120[LN]\Pos	10	Open	13:16:01.774	IEC 61850 ...	Subscription
Substation[S]\Station6[VL]\BAY60[B]\Q01[CE]\CBCSWI120[LN]\Pos	10	Open Executed	13:16:01.658	IEC 61850 ...	Subscription
Substation[S]\Station6[VL]\BAY60[B]\Q01[CE]\CBCSWI120[LN]\Pos	10	Open Selected	13:15:59.545	IEC 61850 ...	Subscription
Timesync client	3	Synchronize: Adjusted ok...	13:15:52.133	IEC 61850 ...	Subscription
IEC61850 Subnetwork\REC670_91\Device Connection Status	1	Connection OK	13:15:38.994	IEC 61850 ...	Subscription
IEC61850 Subnetwork\REC670_90\Device Connection Status	1	Connection OK	13:15:38.994	IEC 61850 ...	Subscription
Substation[S]\Station4[VL]\Bay93[B]\REC670_93[IED]\Device Connection Status	1	Connection OK	13:15:38.794	IEC 61850 ...	Subscription
IEC61850 Subnetwork\REC670_93\Device Connection Status	1	Connection OK	13:15:38.794	IEC 61850 ...	Subscription
Substation[S]\Station4[VL]\Bay94[B]\REC670_94[IED]\Device Connection Status	1	Connection OK	13:15:38.704	IEC 61850 ...	Subscription

AE_simple_tracking_events.jpg

Figure 3.5-3 An example view of simple and tracking events



Source	Condition	Severity	Message	Time	Actor ID	Subcondition
IEC61850 Subnetwork\REF543_54\LD1\ESWCSWI127\Pos	SwitchPosition	10	Intermediate	10:17:45.083		Intermediate
IEC61850 Subnetwork\REM543_66\LD1\ESWCSWI129\Pos	SwitchPosition	10	Intermediate	10:55:25.496		Intermediate
IEC61850 Subnetwork\REF545_64\Device Connection Status	Device Connection Status	1	Device Con...	13:11:32.338		Device Con...
Substation[S]\Station6[VL]\BAY64[B]\REF545_64[IED]\Device Connection Status	Device Connection Status	1	Device Con...	13:11:32.348	admin	Device Con...
IEC61850 Subnetwork\REC670_92\Device Connection Status	Device Connection Status	1	Device Con...	13:11:48.383		Device Con...
IEC61850 Subnetwork\REC670_94\Device Connection Status	Device Connection Status	1	Device Con...	13:11:48.493		Device Con...
Substation[S]\Station4[VL]\Bay94[B]\REC670_94[IED]\Device Connection Status	Device Connection Status	1	Device Con...	13:11:48.493	admin	Device Con...
IEC61850 Subnetwork\REC670_93\Device Connection Status	Device Connection Status	1	Device Con...	13:11:48.683		Device Con...
Substation[S]\Station4[VL]\Bay93[B]\REC670_93[IED]\Device Connection Status	Device Connection Status	1	Device Con...	13:11:48.693	admin	Device Con...
IEC61850 Subnetwork\REC670_91\Device Connection Status	Device Connection Status	1	Device Con...	13:11:48.693		Device Con...
IEC61850 Subnetwork\REC670_90\Device Connection Status	Device Connection Status	1	Device Con...	13:11:48.713		Device Con...

pics/AE_conditions.jpg

Figure 3.5-4 An example view of condition events

3.6. DCOM configuration

User authentication is required between the client and the server computer. In practice, this means that the same user account with the same password must exist in the COM600 Computer and in the 3rd party OPC Client computer. The OPC Client must be run within this user account.

OPC servers in COM600 Computer are run within a preconfigured user account named as COM600 (factory default password: aEc2006rs). One possibility is to create the COM600 user to the client computer as well, and run the OPC Client within this user account. Another possibility is to create a new user to the COM600 Computer, the same user that is used in the client computer. In the latter case it is still required to create the COM600 user to the client computer as it is needed for the OPC servers' access to the client computer.

Note that if you want to change the default COM600 user's password it must be done using the management tool in SAB600, as the password is configured in the DCOM configuration for each component in COM600.

It is also required to enable the DCOM in the client computer. This can be done using the DCOMCNFG program. If the client computer is running on Windows XP you must note the following: the default installation for XP forces remote users to authenticate as Guest. This means that DCOM clients cannot connect to a server running on an XP computer unless the Guest account is enabled and has enough rights to launch the server.

To adjust the setting from the control panel:
1. Click **Start/Control Panel/Administrative Tools**.
2. Open the **Local Security Settings** window.
3. Expand the tree view and select **Security Options** in the left-hand pane.
4. In the right-hand pane, scroll down and select **Network Access**: Sharing and security settings for local accounts.
5. Right-click and select **Properties**.
6. Select **Classic - local users authenticate as themselves**.

More information about setting up the DCOM can be found from the Microsoft and OPC Foundation internet sites. OPC Foundation has published a number of reports about using OPC via DCOM, which can be downloaded from their internet site (www.opcfoundation.org)

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